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(54) PACKING DEFORMABLE PRODUCTS IN BOXES

(57) A process for packing deformable products, such as flexible sachets, consists of arranging a number of products on a conveyor 14 in rows which extend perpendicular to the direction of forward movement of the conveyor 14, moving the conveyor to bring each row of products under a transfer device 16 comprising a plurality of suckers, bringing the suckers into contact with the products so that they are gripped, moving the suckers to transfer the products simultaneously to a box 19 in a direction perpendicular to the direction of forward movement of the conveyor whilst causing the suckers to approach one another so that the products move together, and finally depositing the products in this position in the box by lowering and disconnecting the vacuum to the suckers.

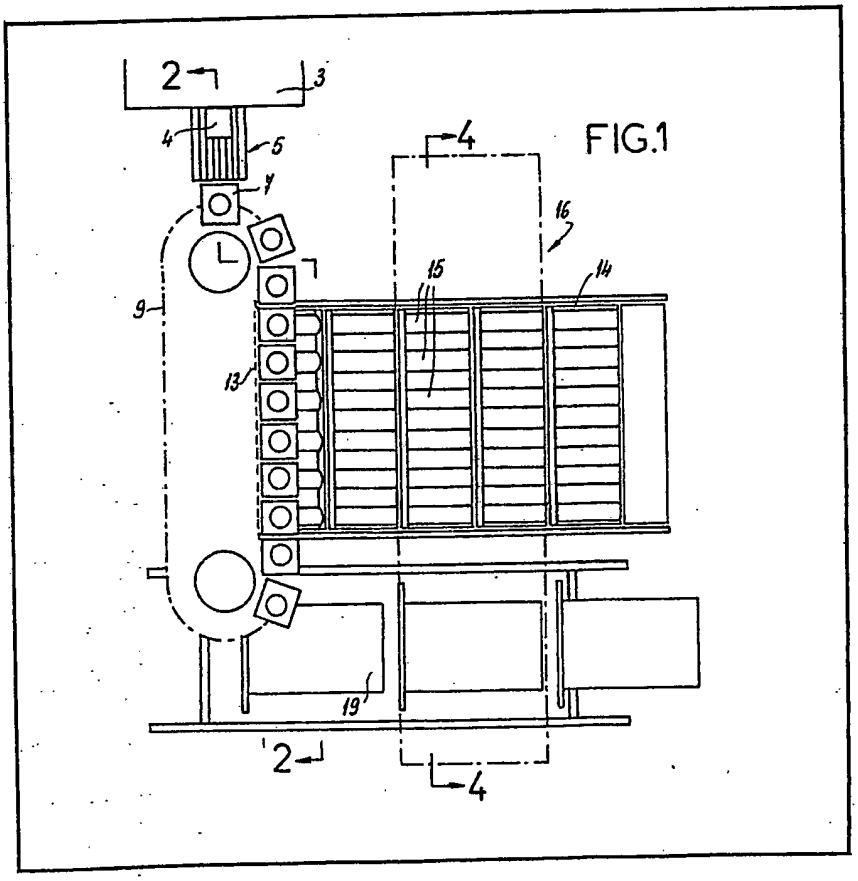

FIG.1

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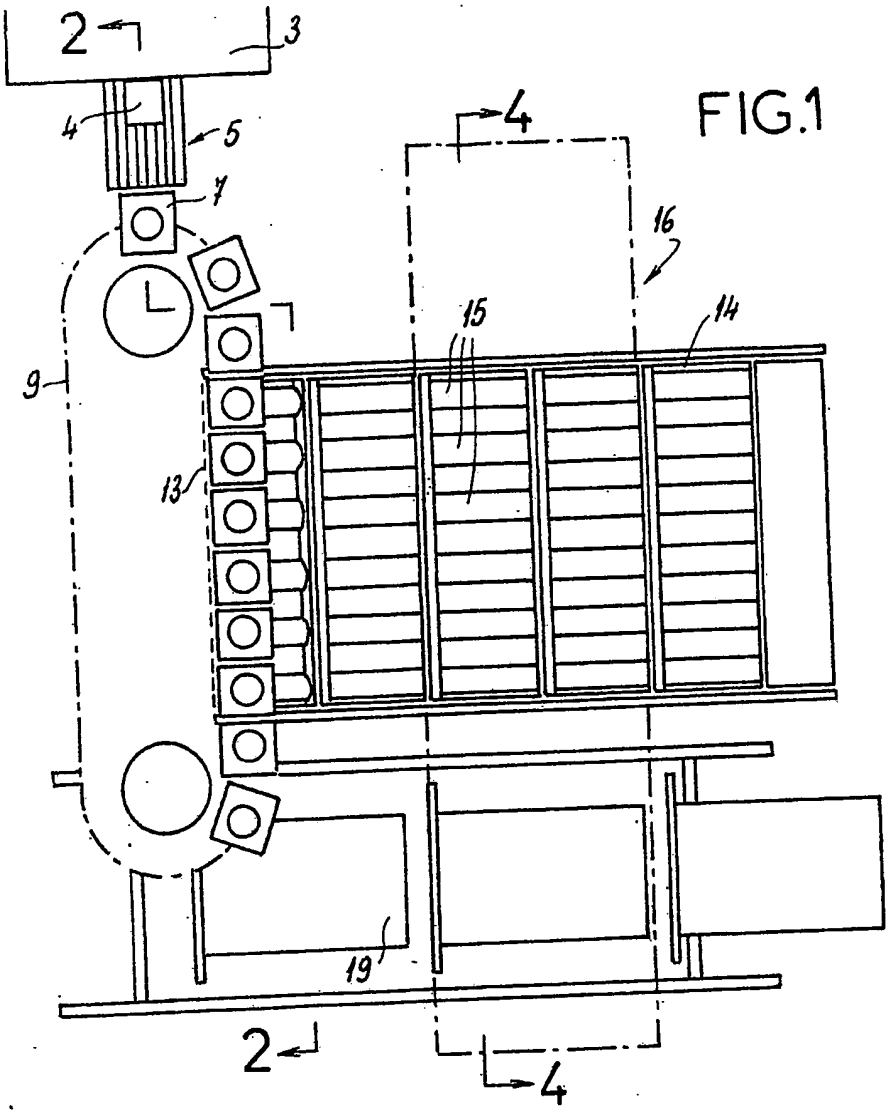

FIG.1

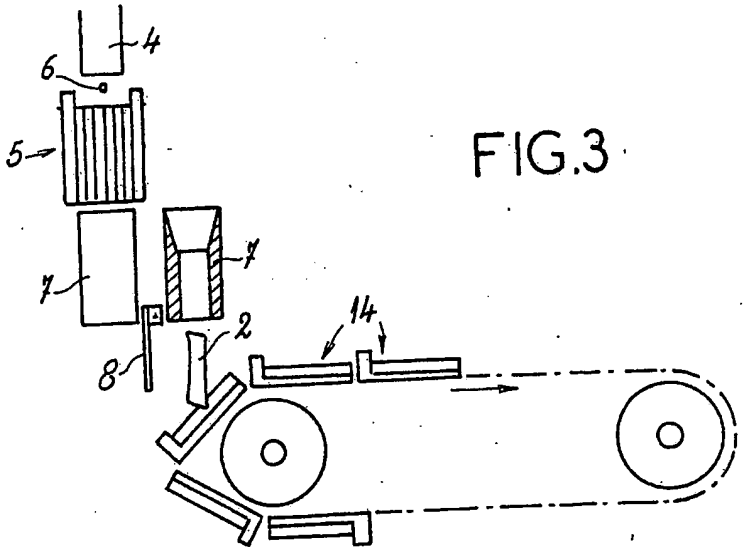

FIG.3

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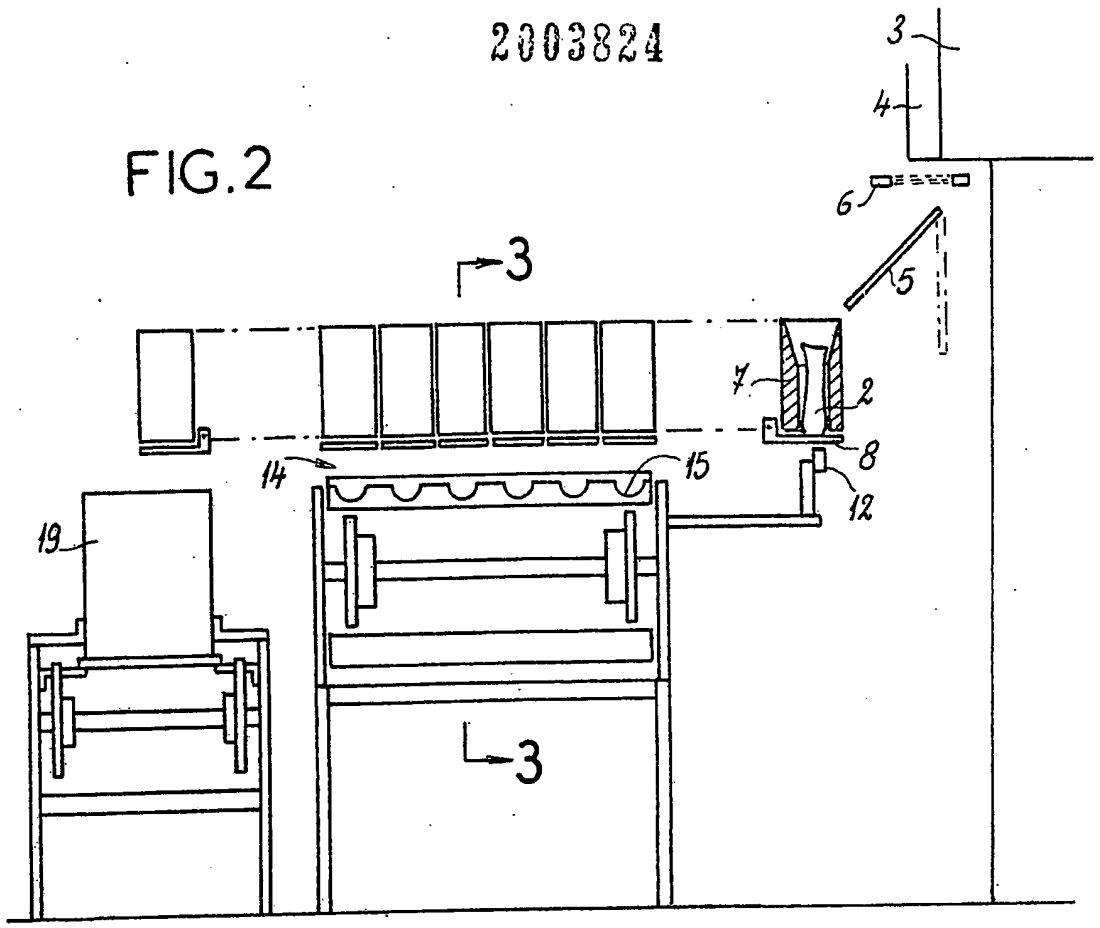
FIG.2



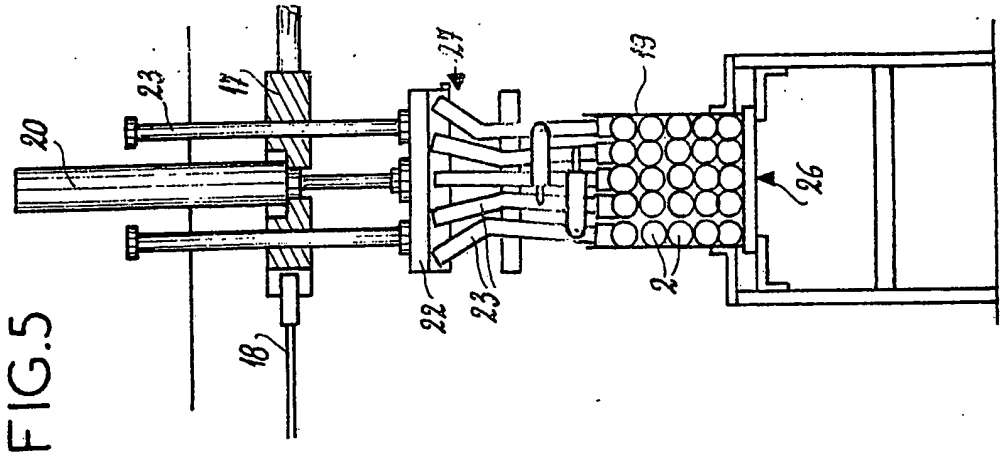


FIG.5

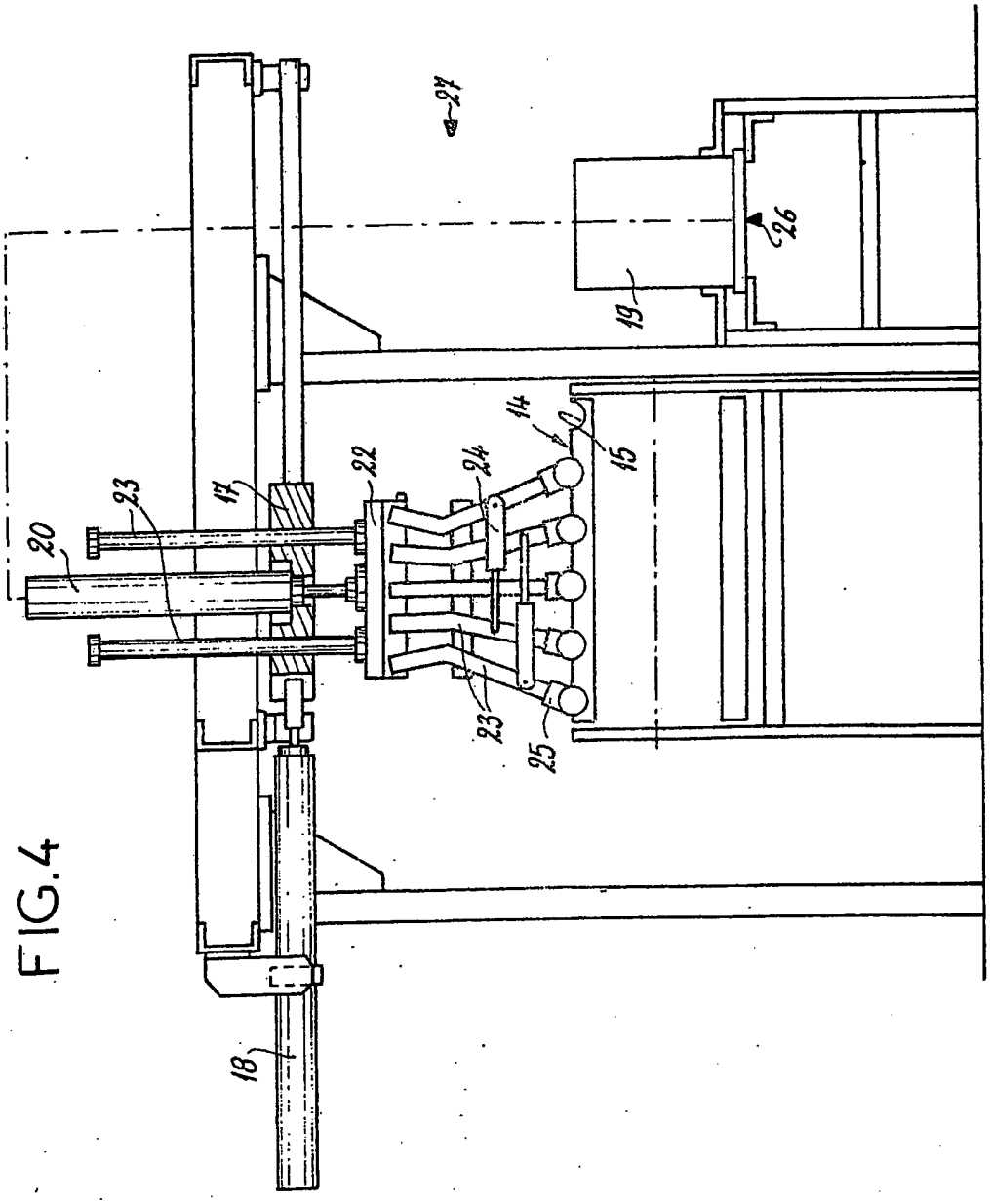


FIG.4

SPECIFICATION

IMPROVEMENTS IN OR RELATING TO A PROCESS AND DEVICE FOR PACKING DEFORMABLE PRODUCTS

This invention is concerned with a process and device for packing deformable products, and it relates more particularly, although not exclusively, to the packing in cardboard cartons of flexible sachets made of a deformable plastic film and used for packaging either fluid, without any pressure, or for solids or powders at atmospheric pressure or at high pressure.

It is standard practice to stow flexible sachets in a box made of corrugated cardboard so as to make maximum use of the volume of the box and always have the same quantity of sachets per box, this method of stowing facilitating both storage and transport of the products.

In most cases the boxing operation is effected manually, the sachets being brought close to the boxing station by conveyor belt. This is a labour intensive process, and a thankless task for personnel.

There are machines which combine the sachets of several manufacturing lines at a single boxing station, where the box is made and presented manually. A machine of this kind must be tough and very reliable in order to be profitable. For example one person is capable of boxing manually 40 sachets of 250 cm^3 per minute. A combining machine requires two persons, the profitable threshold is therefore approximately at practical rate of 160 sachets per minute, i.e., an instantaneous rate of 200 sachets per minutes. At this high rate, it is very difficult to achieve the combining and monitoring in position of the sachets, the geometric shape of which is not well defined, and which cannot be handled by accumulation. The tricky point is essentially the transfer from one conveying system to another having a different speed, which causes, at the time of accelerating and decelerating, a dispersion in the positioning of the sachets which it is different to control.

The operation is not so tricky in the case of flat sachets, the stability of which is better and which may be accumulated on top of each other. An object of this invention is to provide a machine in which the position of each sachet is known precisely from its closure to the moment when it is placed in a box. The machine according to the invention is intended to be associated with each sachet closure station, the boxing machines being supplied by a distribution network consisting upstream of a carton forming machine which distributes these with a closed bottom and lid flaps wide open. The only problem then is the problem of distributing the empty boxes to several boxing machines. Nonetheless, in this case, it is a matter of handling solids of a geometric shape, which is a problem which has already been solved.

According to the invention the packing process consists of arranging disjointedly in the form of rows and positioned the same as in a box on a conveyor belt, a number of products to form a layer in the box, each row of products being arranged perpendicular to the direction of forward movement of the conveyor belt and of bringing, by movement of the conveyor belt, each row of products under a gripping device comprising a plurality of suckers connected to a vacuum device, the number of suckers being at least equal to the number of products of a layer, or bringing the suckers into contact with the products so that they are gripped, of moving the gripping device to transfer the products to a box in a direction perpendicular to the direction of forward movement of the conveyor belt whilst ensuring the approach of the suckers, so that the products move together and, finally of depositing the products in this position in the box by lowering the gripping device and disconnecting the vacuum at the suckers.

At the time the sachets are raised, they undergo, due to the effect of gravity, and their flexibility, a deformation, their height increasing whilst their width reduces. It is therefore possible to bring the sachets into contact with each other and to introduce them simultaneously into a box of relatively slight width.

It should be noted that the device effecting transfer by suction is also of interest in that with regard to the various suckers, since they are fitted in series, if by chance one of the sachets to be transferred is empty the seal is not effected when it comes into contact and none of the sachets of the layer concerned are transferred. This therefore avoids having boxes with certain layers incomplete.

The device for implementing this process comprises in addition a product unit transfer device allowing the formation of rows, each of which houses as many products as each row of the box, and a device for transferring rows under the gripping device.

It is an advantage if the product unit transfer device allowing the formation of rows has a certain number of cups, each of which is used to accomodate a product, and which are laid out so that at the level of the row transfer device there are a number of cups corresponding to the number of products of a row, which are aligned.

The cups are loaded one by one as these pass by in a specific zone.

In addition it is an advantage if the cups can be moved horizontally parallel to the plane passing through their bottom, all of the cups being connected to a forward indexing device, controlled by the unit filling of the cups. The bottom of each cup is retractable, and the device has facilities making it possible to effect simultaneous retraction of all the cups aligned to correspond with a row of products.

The forward indexing movement of the cups may be controlled by the dropping of a sachet into an empty cup. During this movement, the bottom of the cup placed in the reception zone shall pivot

slightly downwards and actuate a switch causing the forward movement of all of the cups.

In accordance with an embodiment of the invention, the cups may be separate from each other, connected to guiding facilities so as to form a closed loop, and driven by an endless chain.

When the chain has moved forward by a length corresponding to the displacement of the number of cups equal to the number of products forming a row, the bottoms of all the cups which are aligned with regard to the product transfer device may be opened simultaneously.

The device for transferring products in rows may have a certain number of plates, hinged to each other, so as to form a closed loop with horizontal centre line, the assembly being driven in steps of a distance corresponding to the width of the plates, each plate comprising a number of honeycomb recesses equal to the number of products in a row and each recess being used to accomodate a product, the product reception zone on a plate corresponding to a position where this is inclined in relation to the horizontal, whilst the zone for gripping products with a view to transferring them into a box shall correspond to a position of the plates where the latter are horizontal.

The fact that reception of the products occurs on an inclined plane is very interesting for it is then possible to be certain of the good positioning, both longitudinal and transversal, of the products in the honeycomb recesses which are intended for them.

For its part, the gripping device shall be connected to horizontal displacement facilities making it possible to bring products successively above the gripping zone and above a box to be filled and shall be connected to vertical displacement facilities, each assembly of suckers intended for the gripping of a product being fitted at the end of an arm, all the arms being hinged around parallel horizontal spindles, facilities being provided to ensure the spacing of the arms at the time products are gripped, and their approach in order to bring the products together at the time they are deposited in a box, the arms being bent so that all the products are in the same plane.

According to an embodiment of this device, the means ensuring pivoting of the arms may consist of double acting rams.

The movement of the sucker transfer device may be triggered when a number of plates loaded with products corresponding to the number of rows of products forming a layer in a box is in the position under the transfer device.

Moreover, this transfer device may have a switch located in the box loading zone, under the box to be loaded, so that the pressure exercised on the box by the transfer assembly will stop its descent, cut out the vacuum at the suckers and control its timed rising and its return to the gripping position.

Finally this transfer device may have a switch located near the loading zone, and which may be actuated by the sucker transfer assembly, during all its cycles, except during the cycle of depositing the top layer, so that actuation of the switch located under the box and non-actuation of this second switch may, after timing, cause evacuation of the full box.

This arrangement is interesting, for departure, of the box after loading does not depend on the number of cycles effected by the sucker transfer device, but simply on the number of layers effectively deposited. If for any reason whatsoever, for example a burst sachet, the device effects an empty cycle, this arrangement avoids a row of products being missed.

Whatever the circumstances, the invention will be well understood from the description which follows, in which reference is made to the accompanying diagrams representing non-exhaustive examples of an embodiment of the machine in accordance with the invention, within the framework of its application to the transfer of flexible sachets.

Fig. 1 is a diagrammatic plan view of this machine;

Fig. 2 is a section along line 2—2 of Fig. 1;

Fig. 3 is a section along line 3—3 of Fig. 2;

Fig. 4 is a section along line 4—4 of Fig. 1;

Fig. 5 is a part view corresponding to the view in Fig. 4, in another position;

The machine shown in the diagram is intended for the transfer of sachets 2 made from a plastic foil by a machine 3 of well-known type effecting the shaping, filling, and closure by welding of each sachet, and separation from the neighbouring sachets. On leaving machine 3, the sachets fall by gravity into a channel 4 and arrive on an inclined plane 5. This inclined plane is essentially a flap hinged around a horizontal spindle, and made from parallel longitudinal rods which ensure the guiding of the sachets.

Upstream of the inclined plane 5, the sachets are detected by a photoelectric cell 6. Since the sachets have to be recovered singly, if cell 6 detects that two sachets have not been separated, it will cause the tipping of flap 5 so that the two sachets fall into a recovery container.

Insofar as everything takes place normally, a sachet 2 slides along inclined plane 5 and falls into a cup 7. This cup 7, the bottom of which is horizontal, belongs to a series of cups which are joined together and form a horizontal loop having at least one straight section. All the cups are equidistant and connected to a chain 9 and to guiding facilities to ensure their step-by-step displacement, each step corresponding to the width of a cup.

In the embodiment shown in the drawing, bottom 8 of each cup is hinged around a spindle 10, and held in the closed position under the effect of a counterweight. It should be noted that when a sachet 2 falls into a cup 7, a slight pivoting of bottom 8 occurs under the effect of the impact actuating a switch 12 causing chain 9 to move forward one step so that the cup following the cup

7 which has just been loaded, arrives at the loading station.

When a number of loaded cups corresponding to the number of sachets which make up a row in the box in which packing is to be effected is in the aligned position above the row transfer device, their bottoms 8 are simultaneously retracted. The control of this may be effected by mechanical electrical or electronic metering or counting of the number of forward movement steps required for the cups, the actual operation itself being carried out by a jack actuating a rod 13 which acts on the counterweights.

The row transfer device has a certain number of plates 14 hinged to each other so as to form a closed horizontal loop.

This assembly is connected to step-by-step plate driving facilities, the step having a value corresponding to the width of a plate. Guiding of the plate is effected so that these may take up successively an inclined position at the level of the product reception zone and a horizontal position at the level of the product evacuation zone, as shown in particular in Figs. 1 and 3. Each plate 14 has a certain number of honeycomb recesses 15 made transversely on the plate, the number of which shall at least be equal to that of the products of a row in the box, or not all of the recesses being used in the case of a narrow box. Therefore in the embodiment shown in the drawing, the plates have six recesses 15, whilst only five are used. It should be noted that each recess 15 is exactly below a cup 7.

It is interesting that at the plate reception zone the plates 14 are inclined and that this makes it possible, as shown in Fig. 3, to use gravity to achieve good positioning of the sachets.

In the embodiment shown in the drawing, a layer of products in the box correspond to two rows of sachets. Therefore two loaded plates 14 should be located under the transfer device towards the box before the transfer device is actuated.

This transfer device 16, shown more particularly in Figs. 4 and 5, has a support part 17 capable of a horizontal movement under the effect of a twin-acting hydraulic jack 18 so as to be capable of being brought successively above plate 14 and above a box 19 which is to be loaded. On support part 17 a twin-acting hydraulic jack 20 is mounted with a vertical shaft carrying a plate 22 connected to guiding columns 23 in relation to support part 17. This jack 20 is intended to ensure the vertical movements allowing the gripping and depositing of the sachets.

On plate 22 five arms 23 are hinged around horizontal and parallel spindles. It should be noted that the outside arms are symmetrical and elbowed outwards, in order that the ends of all the arms are always located largely in one and the same plane, whatever their angular position.

The position of arms 23 is controlled by two jacks 24 connected to the outside arm, the central arm for its part being fixed. The free ends of arms 23 are equipped with suckers 25 connected to a vacuum plant, at least one set being provided opposite each recess 15.

Fig. 4 relates to the gripping of sachets 2 on plates 14. In this case, the arms are spaced, and the end of each rests on a sachet. When a vacuum is created, the sachets are flattened against the suckers by suction. Under the effect of jack 20, the assembly is raised after which arms 23 are brought together in order to bring the sachets together, jack 18 bringing the assembly above box 19. Jack 20 ensures the lowering of the sachets and deposits these in case 19. At the end of the stroke, the arms exercise a pressure on the box, which is transmitted to a switch 26, which, located under the loading zone, causes the stoppage of the downward movement of the arms, the cut-out of the vacuum in the suckers and the timed rising of the arms, with a view to effecting a new gripping cycle. It should be noted that during each cycle, plate 22 actuates a switch 27. At the time the last layer of sachets 2 is deposited, plate 22 does not actuate switch 27, but actuates switch 26. This information indicates that the loading cycle of a box is finished, which causes evacuation of this box.

As is obvious, the invention is not limited solely to the method of implementation of this process nor the sole embodiments of this device described above as examples, on the contrary it covers any variants. In particular the device for forming rows could consist not of individual cups, but of a large-diameter disc with central driving unit, having recesses very close to each other, so that several neighbouring recesses may be considered as aligned. The driving device would be much simpler in the case of a disc and cleaning of the cups would be simplified, which is of interest particularly in the case where the sachets contain corrosive products, such as bleach and disinfectant.

It will also be possible to provide positive opening of the bottoms of the cups, and not an opening under the effect of gravity. This arrangement would make it possible to increase the frequency rates, for gravity would only intervene to ensure the dropping of the sachets.

It will also be possible to provide other arm spacing devices for the suction transfer assembly. In a variant, spacing of the arms could be achieved in terms of the position of the support, by cams, the approaching of these being ensured by return springs.

CLAIMS

1. A process for packing deformable products, such as flexible sachets, consisting of arranging disjointedly in the form of rows and positioned the same as a box on a conveyor belt, a number of products to form a layer in the box, each row of products being arranged perpendicular to the direction of forward movement of the conveyor belt, and of bringing, by movement of the conveyor belt, each row of products under a gripping device comprising a plurality of suckers connected to a vacuum device, the number of

suckers being at least equal to the number of products in a layer or bringing the suckers into contact with the products, so that they are gripped, of moving the gripping device to transfer the products to a box in a direction perpendicular to the direction of forward movement of the conveyor belt whilst ensuring the approach of the suckers, so that the products move together, and finally of depositing the products in this position in the box by lowering the gripping device and disconnecting the vacuum at the suckers.

2. A device for carrying out the process of claim 1, in which a transfer device for transferring single products enabling the formation of rows, has a certain number of cups, each of which is used to accomodate a product, and which are arranged so that at the level of the device for transferring rows, a number of cups corresponding to the number of products in a row are aligned.

3. A device in accordance with claim 2, in which the cups are moveable in a horizontal plane, parallel to the plane passing through their bottom, the assembly of cups is connected to a step-by-step forward movement device controlled by the single filling of the cups, the bottom of each cup is retractable, and means are provided for effecting simultaneous retraction of the bottoms of all the cups aligned corresponding to a row of products.

4. A device in accordance with claim 2, in which the transfer device for the products comprises a large diameter disc having a central driving unit and having near its periphery equidistant recesses which in practice are joined forming the cups.

5. A device in accordance with any one of claims 2 to 4, in which the device for transferring products in rows has a certain number of plates, hinged to each other, so as to form a closed loop with horizontal spindle, the assembly being drivable in steps of a distance corresponding to the width of the plates, each plate having a number of recesses equal to the number of products in a row and each recess accomodating a product, the reception zone of the products on a plate corresponding to a position where this is inclined in relation to the horizontal, whilst the gripping zone of the products with a view to their transfer into a box corresponds to a position of the plates where these are horizontal.

6. A device in accordance with any of claims 2 to 5, in which the gripping device is connected to horizontal displacement means making it possible to bring it successively above the product gripping zone and above a box to be filled and is provided with vertical displacement means, each assembly of suckers intended for gripping of a product being fitted at the end of an arm, all the arms being hinged around horizontal and parallel spindles, means being provided to ensure spacing of the arms at the time of gripping of the products, and their approach in order to bring the products together at the time they are deposited in a box, the arms being cranked so that all the products are located in the same plane both at the same time they are gripped and at the time they are deposited in a box.

7. A device in accordance with claim 6, in which the means causing spacing of the arms with a view to gripping of the products comprises of cams, their approach being effected by return springs.

8. A device in accordance with any of claims 2 to 7, including a switch located in the loading zone of the boxes, under the box to be loaded, so that the pressure exerted on the box by the transfer assembly causes the stoppage of the downward movement of the transfer assembly, disconnects the vacuum at the suckers and controls its timed rising and its return to the gripping position.

9. A device in accordance with claim 8, including a switch located near the loading zone, which can be actuated by the sucker transfer assembly during any of its cycles except during the cycle corresponding to depositing of the top layer, so that the actuating of the switch located under the box and the non-actuating of this second switch causes, after timing, evacuation of the full box.

10. Application of the process and the device in accordance with any one of the preceding claims to the packing of sachets consisting of flexible containers made by thermo-welding from a sheath of plastic and evacuated on leaving the shaping and filling machine on an inclined plane, in which this inclined plane consists of longitudinal rods which bring it above a cup into which it drops, this inclined plane having a flap which opens in order to prevent passage of the sachet towards the cup, if a photoelectric cell located upstream detects that the sachet has not been separated from the following sachets.

11. A process for packing deformable products substantially as hereinbefore described with reference to the accompanying drawing.

12. A device for packing deformable products substantially as hereinbefore described with reference to the accompanying drawings.

13. Any novel subject matter of combination including novel subject matter herein disclosed, whether or not within the scope of or relating to the same invention as any of the preceding claims.

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